

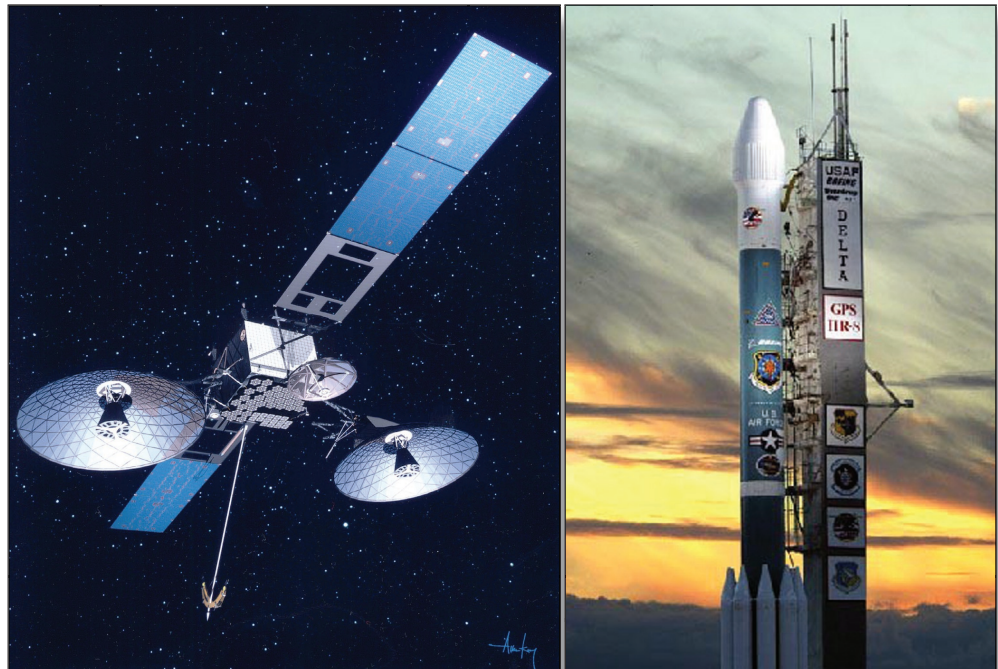


# Air Force Research Laboratory|AFRL

*Science and Technology for Tomorrow's Air and Space Force*

## **Success Story**

### **LEAN PRODUCTION APPROACHES BENEFIT SPACE VEHICLE INTEGRATION AND TEST**



Under contract with the Materials and Manufacturing Directorate's Manufacturing Technology (ManTech) Division, researchers at Northrop Grumman developed a lean production approach to produce multiple unique space vehicles faster and in a more cost-efficient manner. Applying this production approach to multiple space vehicle builds can save up to 50% in costs and 70% in cycle time related to mechanical build cycles.

Manufacturers realize savings through simplified operations and reduced learning curves, defect occurrences, span times, and capital equipment requirements. Additional significant savings are possible through design reuse as a result of electronics packaging hardware developed on this program.



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## **Accomplishment**

ManTech and Northrop Grumman created the Flexible Space Vehicle Production Line (FSVPL) program for flexible, or variable, production volumes for the high-performance military and civilian satellite market. FSVPL focused its efforts in two primary areas.

The first area—a design for lean production—focused on developing designs that could be more readily producible in a volume environment modeled after the “lean production” methodology developed by Toyota and used throughout the automotive and aviation industries for decades. The second area—standardized electronics packaging—designed, developed, produced, and qualified a mechanical package to house electrical components. This package, commonly referred to as the electronic “box,” includes all the mechanical housings inside the box that hold critical electrical components.

ManTech and Northrop Grumman then demonstrated the program’s technical efforts in a pilot plant demonstration. They ran full-scale mock-ups of space vehicles through a simulated factory environment to validate program designs and approaches.

## **Background**

Space vehicle integration and test (I&T) is a very costly and time-consuming portion of any satellite program, with cycle times ranging from 6 months to several years in duration. The increasing need to quickly launch new technology resulted in a focus upon reducing all aspects of space vehicle development and build cycles including I&T.

In the area of design for lean production, the FSVPL Team developed a flexible architecture approach to accommodate many missions and orbits with a variety of configurations. This modular and scaleable approach focuses on populating panels with equipment, so that the panels can be built up in parallel with structural and other subsystem elements.

This parallel build approach means that several teams of workers can produce different components of the space vehicle in separate areas concurrently, instead of one team of workers building everything in sequence. The architecture approach reflected in FSVPL design guidelines translates lessons learned to all new programs.

The crowning achievement of the FSVPL Team was the standard electronics packaging design. This design accommodates a highly robust mechanical package, allowing for easy installation, access, troubleshooting, and removal and replacement.

## **Additional information**

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-23)